The diversification of higher education in England

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Part Two: The Diversification of Institutions

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A little more than a century ago the higher education of England began the transformation that in time produced the pre-eminence in national life ascribed to it by Harold Perkin in this volume. New universities, colleges, technology schools, and government-funded research organizations were established. Whole new areas of knowledge, scarcely known in 1860 or known only in embryonic form, were introduced, first gradually and then, about 1880 or 1900, much more rapidly. Disciplines and sub-disciplines acquired the autonomy they now enjoy as professional careers, although not overnight, not at the same pace and not with the same degree of recognition in each case.

By 1930, there were in the United Kingdom two ancient English universities, a quartet of Scottish ones, universities and university colleges in Ireland north and south, a Welsh federated university, a large group of Victorian universities and colleges in London and the provinces, and a new group of twentieth century redbricks modelled on their civic predecessors. There were also non-university technical and arts colleges. In architecture and ethos, in student body, national reputation and financial support, in the style of self-government and in relation to their surrounding communities, these foundations differed greatly one from the other; but they were converging on a single type of institution, that of the present-day research and teaching university, emphasizing original scholarship and science and committed to professional training, with a small but growing postgraduate sector and a faculty chosen largely for its competence in the several fields of study and teaching. Some three-quarters of a century earlier their social and educational differences had been much sharper. In origin they were diverse, had grown up in response to different audiences, and for many decades did not always share the same higher education mission.

It is customary to associate the transformations in the world of higher learning with changes in the central direction of English history occurring in the late nine-

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teenth century. The period after 1870 was one of imperial expansion, sharp international trading rivalry, the application of science to manufacturing, and the development of the large industrial corporation. In these changing circumstances there was room for a new university mission. New industries, especially in chemicals, metals, or synthetic textiles simply could not function without applied science or high-level technological innovation, and they did not have traditions of basic research behind them to make the necessary technical changes unaided. Furthermore, better-trained managers were required in the large, publicly-owned firms. If such people did not themselves require training in research, they certainly had to understand the technical processes vital to industry. The imperial experience also encouraged a new perspective on the uses of higher education. Overseas expansion stimulated specific kinds of scientific work, for example, in tropical medicine or in civil and mechanical engineering, especially in connection with the construction of mines, ports, railroads and factories. The growth of government was yet another reason for an enlarged university role. The expansion of government through the establishment of a civil service recruited by competitive examinations led to the development of courses of university study as preparation for them. The increasing intervention by government into the economy and society also encouraged the growth of new professions, as in the social services or teaching.

It is equally true that the connection between higher education and other institutions was most often tenuous and unpredictable. The work of building a higher education system involved large numbers of scholars, scientists, civil servants, policy makers, pressure groups, community organizations, publicists, philanthropists and industrialists, as well as professional men and women not themselves in academic life. Given the strongly individualist character of Victorian society, their efforts were not and could not have been fully coordinated. From a dirigist point of view, the transformation of higher learning in England was largely uncoordinated and haphazard, full of what in historical retrospect appear to be digressions, misplaced emphases, lost chances, false starts and conflicts. To be sure, even historical irregularity has a logic, insofar as occurrences in time cannot be wholly random but must bear some relation to the overall culture of a society. This, at least, was the joyful conclusion of the mid-Victorian positivist, Thomas Henry Buckle, who claimed to have taken the idea from the poet and philosopher Goethe. But if institutional linkages existed, they were neither mechanical nor precise, and it is well to remember the somewhat anfractious route by which the university of the nineteenth century arrived in the twentieth.

In the essay that follows I take the fact of diversification as given, and I concentrate instead on the principal causes behind the remarkable intellectual and academic transformation in higher education. "Causes" must be understood as efficient or proximate rather than final, as reasons, explanations or categories rather than prime movers. To bring these out I have adopted a mode of discussion that moves between normative and historical explanation, that asserts what may be typical in a particular transformation but also recalls what actually happened. For purposes of comparison, as well as taxonomy, a normative approach is clear and useful, but it can never be wholly satisfying. It is static while history is dynamic, a process where events assume a character specific to time and place. It is my hope, therefore, that the two approaches will complement one another.

Changes in the structure and purpose of higher education bear a closer causal relationship to the development of an urban society than to industrialism *per se,* even though the latter has an obvious effect on the former. City life mediates economic change and redistributes its effects, generating a high and continuing demand for the most varied social and personal services. The spectacular growth of an urban consumer culture in the nineteenth century provided higher education with an opportunity to supply England with large numbers of specialists who increasingly called themselves "professional men," and behind them were the academicians, the members of the "key profession," the one that trained the others.[1]

Curiously, or perhaps understandably given the magnitude of the task, there are no standard histories of academic professionalism in England, although there are studies of the metamorphosis of the Oxbridge clerical don into the career university teacher. As late as 1911 census returns put university faculty into the blanket category of "teachers."[2]

Much work remains before useful detailed conclusions can be compiled concerning the relationship between the kind of bonding we call professionalization and the diversification of university and technical instruction. Certainly what needs to be solidly appreciated is that professionalization is an aggressive process. It has a self-propelled internal quality, or to invert a Victorian aphorism more used now than then: men may not make history exactly as they please, but they do try to make it. The characteristics of academic professionalism may be identified as measurable or certifiable competence, peer approval, full-time devotion to a career, and freedom from personal subservience or independence but through association.

The service function that lies at the heart of any professional self-perception requires a high degree of control over the market. The lead time necessary to establish teaching programs, train students and faculty, plan and carry out research or any of the other familiar academic tasks necessitates insulation from short-term economic fluctuations. Independence is particularly sought by academics because, not being self-employed, they are and have been vulnerable to changes in the economy and society. Their role model has not been the independent practitioner—the lawyer or physician, for example, who enters into a personal or fiduciary relationship with his client—but the public employee, the state administrator or army officer or Church of England clergyman. But the desire for independence has remained a constant.[3] Hence from the middle of the nineteenth century onwards the move towards academic professionalism has been characterized by special efforts to keep curriculum, recruitment, career, academic disciplines and the definition of service fully in academic hands. Since at no time are professors fully protected from shifts in supply

1. Harold Perkin, *Key Profession* (New York, 1969) and his essay in this volume.
2. Lord Ashby, "The Academic Profession," in *Minerva,* 8 (1970), 91.
3. From his study of industrial scientists and engineers today Kenneth Prandy has concluded that the self-conception of professional men and women is directly affected by a sense of autonomy. Strong feelings generate a concern for status, weak ones for class. Kenneth Prandy, *Professional Employees: A Study of Scientists and Engineers* (London, 1965), 41, 44, 175-8.

and demand, the phrase "ivory tower" has to be understood as symbolic rather than actual.

The idea of the academic as a professional man was compounded of two traditions, that of the Scottish university teacher and the Oxbridge don. The former had the greatest influence on the faculty organization of the newer universities, with the exception of Durham, which borrowed heavily from Oxbridge. Oxford and Cambridge in general contributed the idea of academic self-government, which itself was a borrowing from certain practices of a land-owning oligarchy long accustomed to sinecures, appanages, patronage, and a relatively free hand in English government and society. From the aristocracy, as well as from the two senior universities, came yet another influence, known to the Victorians as the "clerisy" ideal, a neologism of the Romantic poet Samuel Taylor Coleridge, and to present-day scholars as the "aristocratic model of professional growth."[4] This consisted of a gentlemanly style of living, a preference for public rather than private employment with the concurrent claim to be acting in the general good, and a group rather than an individualist ethic of behavior. The clerisy ideal was not wholly aristocratic, however, for it also included nineteenth century beliefs in merit, career, hard work and useful employment, as well as the necessity of competition as proof of good character, although in practice attention-getting had to be played down in the interests of group harmony. It should be apparent that such a guide or model for professional behavior has the latent function of reinforcing a sense of academic independence and of softening the suggestion of self-interest and ambition.

To the question posed in Konrad Jarausch's introduction, at what point in its history is an academic activity considered to be a profession, I return the tentative theoretical answer that this occurs when a branch of learning is considered to be the basis of a career, when that career becomes a virtual end in itself, and when its practitioners believe they have fundamental control over the survival, growth and perpetuation of their occupation. Thus the professor of botany at Cambridge in the 1850s was not a professional scientist because he thought of himself primarily as a parish priest. In the same period Sir Henry Maine, one of the pioneers of cultural anthropology, explained that as he could not earn a living as a professor, he practiced law as well.[5] None of this, however, is to be confused with the notion that academic professionalism depends upon absolute agreement on the methods of a particular field, for under situations of an expanding knowledge base such agreement is not likely to occur.

If professionalism was the ultimate thrust of academicians in mid-Victorian England when the "take-off" began, then it must also be acknowledged that the conditions for academic independence were not achieved in the nineteenth century. Arguably they have been more closely approximated in the twentieth century. In Victorian England there was considerable intervention into the affairs of Oxford, Cambridge and the Scottish Universities by Parliament and the Privy Council. Newer founda-

4. Magali Sarfatti Larson, *The Rise of Professionalism, a Sociological Analysis* (Berkeley, 1977), Chapter 6; Sheldon Rothblatt, *The Revolution of the Dons* (London, 1968), 86–93.
5. Ashby. See also Sheldon Rothblatt, review of *From Status to Contract: A Biography of Sir Henry Maine, 1822–1888,* by George Feaver, in *Journal of Modern History,* 43 (1971), 158–9 for the institutional source of Maine's occupational "pluralism."

tions were inadequately financed and matriculation levels too uneven to provide for either stability or predictable expansion. Furthermore, the civic universities, Durham, London and even the new collegiate foundations of Oxford and Cambridge were in varying degree subject to the authority of lay councils. Only the medical faculties of universities enjoyed comparative independence by virtue of their earlier recognition as part of a liberal profession. Beginning about 1900 academic senates began to take a stronger part in institutional decision making, and from then on in the provincial universities diversification was essentially a matter over which faculty had a larger degree of control.[6]

Finally, it must be understood that the phasing in of new subjects, new methods of research, new staffing patterns, library and museum development and innovation in general occurred at differential rates of change according to location, funding, sense of mission and institutional organization. Each segment of the academic profession followed a chronological development peculiar to itself, so that at any point in the last half of the nineteenth century the historian encounters status uncertainties, internal disagreements over curricula, widely divergent views on career and service, different measurements of competence, and a mixture of role model and reference groups within each branch of learning. A checkered history is more typical of academic professionalism than normative discussions can possibly suggest.[7]

Medicine jumped out first in the nineteenth century and led the way towards academic professionalism and consequently diversification. This was not surprising. The condition of cities called for a major epidemiological effort, and the consumer demands of a society with increased per capita income and concern for the quality of everyday life certainly favored the growth of a medical profession. Furthermore, physicians, if not surgeons or apothecaries, enjoyed a certain historic prestige which could be capitalized upon when needed. Medicine became the umbrella under which new scientific subjects entered the university, e.g., physiology, bacteriology, medical physics and organic chemistry. For centuries, in fact, medicine held an honorable place in the pantheon of university disciplines (if less honorable in the eighteenth century).[8] Physicians, surgeons and apothecaries often led the way in finding support for science. They were the prime movers, for example, behind the scheme to establish a Royal College of Chemistry in 1845.[9] They were the principal founders of medical

6. Graeme C. Moodie and Rowland Eustace, *Power and Authority in British Universities* (Montreal, 1974), 27–38. See also Lord Ashby's remarks in A. C. Crombie, ed., *Scientific Change* (London, 1963), 727.
7. For disagreements over the use and nature of economics by academic economists see Michael Sanderson, *The Universities and British Industry, 1850–1970* (London, 1972), 189. Differences in the internal history of a particular discipline can sometimes be attributed to the work of leading personalities or to timing or to both. See Richard Southern, *The Shape and Substance of Academic History* (Oxford, 1961), 11, 14; D. J. Palmer, *The Rise of English Studies* (London, 1965), 51, 71.
8. Roy Porter, "Science and the Universities," in *British Journal for the History of Science*. 9 (1976), 321.
9. Gerrylynn K. Roberts, "The Establishment of the Royal College of Chemistry: An Investigation of the Social Context of Early Victorian Chemistry," in *Historical Studies in the Physical Sciences*, 7 (1976), 437–86.

schools in the provinces, and several of these, such as Sheffield and Birmingham, became the nuclei of civic universities. Physicians like George Birkbeck had a strong hand in the establishment of what became known as University College, London, and the metropolitan evening college that today bears his name. It is a well-known fact that the success of the medical school at U.C. enabled it to survive a difficult childhood. One of the reasons that University College with its nonconformist, utilitarian and radical backing, and King's College, an Anglican foundation, were able to bury their differences and associate together as the University of London in 1836 was probably the common interest in medicine. By 1851 nearly 60 medical colleges, mostly free standing but some part of hospitals, were affiliated with the London University, which at that date was an examining rather than a teaching institution, the burden of instruction falling upon the constituent colleges and schools.

Some form of profession building had been going on in England since the eighteenth century, but from 1870 to 1880 onwards the movement towards academic professionalism accelerated. Furthermore, it now took a turn towards a wholly new objective, mission or purpose. This can be illustrated by the work of the famous commissions of inquiry appointed by the Crown and by Parliament to inquire into the teaching, studies, revenues and discipline of Oxford and Cambridge. The two that reported in the 1850s were concerned with the improvement of tutorial or collegiate instruction, but the ones that came after concentrated on improving the university or professorial part of instruction, and this began to include a formal research mission. The first set of commissioners thought in terms of a teaching institution, keeping before them the traditional "idea" of a university as a place for the dissemination of knowledge, not its advancement, and for the moral superintendence of young and immature students rather than for the imparting of skills and competencies. Even in the middle decades of the nineteenth century German science and scholarship were considered means of improving teaching, not a set of methods for pursuing basic knowledge. While the teacher might be allowed to undertake systematic inquiry in a particular field, it was not held to be an essential requirement for teaching. Because research, stressing critical inquiry, was thought to have a subversive dimension, it was far better to imitate than innovate. By contrast, the later commissions talked about encouraging research, improving technology and professional competence, and building up new specialties and disciplines. The problem was no longer one of making available to new social groups the knowledge that well-educated people already possessed, but of engaging higher education in the task of national advance and prosperity.

Demand for Higher Education:

Few topics in the history of the growth and diversification of higher education are so poorly understood as the function of demand. It is still glibly assumed that shifts in social stratification, or profound changes in the economy or evidence of a growing working-class consciousness provide undeniable proof of the existence of strong demand for increased access to institutions of higher education or of a new audience for new subjects. Such was simply not the historical case. The evidence for demand from below is almost always contradictory, confusing and ambiguous, whether for

basic literacy or numeracy or higher education.[10] There is a tendency in the history of education generally to assume demand when the supply side may be the crucial variable.[11] For instance, it is all too often asserted that the educational leaders of England thwarted the demands of parents for increased access to all levels of education for their children.

Without denying that social snobbery was a feature of Victorian culture, it must nevertheless be noted that the demand for higher education throughout the nineteenth century and well into the twentieth was spotty, to say the least, and being unreliable presented newer institutions with major headaches. Since their start-up costs were high, requiring an initial large capital outlay for construction and land, money for staff was in short supply, and little in the way of funding was available for the diversification of curriculum. The civic universities and London and to a certain extent Durham were established on the liberal political premise that once in operation these institutions would be successfully responsive to market forces. Their founders hoped that sufficient fee-paying students would be attracted to make a full program of studies possible. But short run disappointments were rather the rule. Many of the newer colleges led a perilous existence for the first decade or two, skating on thin financial ice which forced them into a variety of cost-cutting and money-raising expedients. When the numbers of full-time students at Owens College, Manchester, fell so low in the 1860s and 1870s that adequate staff could not be retained, evening classes and special courses for schoolmasters were introduced in order to attract students and increase fee income.[12]

In retrospect it is easy enough to criticize this decision which inevitably pushed the new foundations towards remedial and compensatory education[13] and compromised their standing in the eyes of older and more prestigious universities, but a reliance on market factors can have this historical effect. The reasons for low enrollments at redbrick are not hard to discern. They were the result of two factors: families where the support of a full-time student was a luxury whose benefits could not be perceived and an inadequate supply of properly prepared young persons. Being hamstrung, the new universities could do little to remedy the situation except wait for the slow and cumulative effects of the Balfour Education Act of 1902. In the meantime they quickly outdistanced their logistical support. Drawing their faculty from the pre-Victorian universities with long traditions of learning and scholarship, facing new social situations with high expectations, the faculty of the civic universities became frustrated and disappointed. And as the process of profession-building continued, with new disciplines and interests developing and the research mission being everywhere adopted, the income problem was exacerbated.

At best the effect of demand on diversification is difficult to measure. It appears to have had the most impact in precisely those areas where professionalization was most prominent, for in general professions feed themselves. Certainly there was a

10. Lawrence Stone, "Literacy and Education in England 1640–1900," in *Past and Present*, 42 (1969), 115–6.
11. But the mistake is not made by Thomas Walter Laqueur. See his *Religion and Respectability: Sunday Schools and Working Class Culture 1780–1850* (New Haven, 1976).
12. Palmer, 56–7.
13. See the contribution by Roy Lowe to this volume.

continuous overall demand for medicine or medical biology, but individual medical schools fared badly, and their success was not necessarily built on numbers. The famous Cambridge medical school, re-established in the 1870s, attracted few students, being staffed for research.[14] At Cambridge there was a demand for classics and mathematics, and at Oxford for Literae Humaniores, but most of the new academic specialties hardly attracted career-minded undergraduates.[15] Some of the most famous Oxford professors, pioneers in the several fields of learning, lectured to empty halls right up to the First World War.[16] This was the anomalous but direct result of the historical fact that the great knowledge revolution of the nineteenth century took place when post-graduate education was in its infancy. The striking structural peculiarity of higher education at the turn of the century was the widening gap between teaching and research, which was only slowly reduced by the introduction of the research degree and the arrival of the older, often foreign-educated student in search of specialized training.

Demand for higher education in general must always be carefully distinguished from demand that produces innovation and diversification. As indicated, instances of the former can be found, but very few examples of the latter. Even so, supply more often led demand in the period up to the First World War and even beyond. Academic career-building had more to do with the transformation of higher learning than student or parental pressures, which, where its effects can be discerned, were generally conservative. Parents preferred familiar and time-tested programs of study to the new directions in knowledge so conspicuous a feature of the world of higher learning before the war. This was as true of the demand for women's education as for men's; for while there is no doubt that a significant number of young women were available for higher education, well-prepared and achievement-minded, they were primarily interested in the subjects of the traditional syllabus. Given the uphill fight against much male opposition to women in higher education and the opening up of careers in elementary, and later secondary education, there is every reason to suspect this would have been the case.

The demand for university services generally other than teaching—for consulting or laboratory research, for example—was no more pronounced in England than the demand for teaching. Despite the anti-business bias implicit in the aristocratic model of professionalism, there does appear to have been a considerable amount of industrial research undertaken by professors in the provincial universities in their early years and by the London professoriate in the period 1900 to 1914. It is entirely possible there was more owing to secret research, as in the steel industry,[17] but it appears safe to speculate that as much of this work was solicited by career-minded academics as was sponsored by profit-hungry industrialists. The failure to develop on-going re-

14. Arthur Rook, ed., *Cambridge and its Contribution to Medicine* (London, 1971), 148.
15. The more specialized parts of the Cambridge Natural Sciences Tripos, for example, did not attract students until the 1890s when it became apparent that the creation of a national system of schooling was producing careers for science teachers. See D. S. L. Caldwell, *The Organization of Science in England* (London, 1957), 186, 196.
16. Charles Edward Mallet, *A History of the University of Oxford* (London, 1968) 3: 446.
17. Michael Sanderson, "The Professor as Industrial Consultant: Oliver Arnold and the British Steel Industry, 1900–1914," *The Economic History Review*, 31 (1978), 585–600.

search contacts between industry and some of the universities was more likely the fault of the former than the latter. In this respect the English and French situations seem comparable.[18]

The Impact of Donors:

Before 1850 universities and colleges had benefited greatly from charitable gifts and endowments for scholarships, professorships, fellowships, lectureships, for buildings, libraries and museums. Over the centuries these had come from many public and private sources, from wealthy merchants or their wives, from bishops, aristocrats and members of the royal family and from government and academics themselves. Motives ranged from religious reasons, honor and noblesse oblige to raison d'etat. This pattern of philanthropy carried on through the nineteenth and into the twentieth centuries, and for some of the same reasons, with the addition of a sense of civic pride, the feeling that great cities must possess universities as once it was believed they must possess cathedrals. Perhaps the most significant instances of gift-giving are the endowments and capital funds that successful businessmen, professional men and civic benefactors used to establish so many of the provincial universities and local medical colleges and technical institutes. Yet the historian who has most concerned himself with Victorian charity is dissatisfied with its overall record. He points out how much gift-giving was by academics of the old boy network, especially those in the ancient foundations, and how little, relatively speaking, came from the sources of new money.[19]

One of the several difficulties in assessing the historical record of gift-giving is the very different requirements of historical periods widely separate in time. If by one measure philanthropy in the sixteenth and seventeenth centuries was more successful than later, it was largely because higher education had not yet developed the voracious appetite it has demonstrated in the past century. The growth of research as a central feature of higher education altered the historic pattern of gift-giving. Very large sums were now needed for the expansion of museums, the creation of science laboratories, the building up of research libraries in all fields, as well as for the construction of classrooms, offices and lecture halls. It was necessary to increase the size of teaching staffs when the student population started to grow but even more so when academic specialism took off. Considerable amounts were particularly required for the establishment of the new university colleges, which shortly grew to university status, and after construction costs were met, there was a need to endow chairs and pay faculty. Even wealthy Oxbridge required substantial assistance. With some exceptions, the financial strength of Oxford and Cambridge lay in the "private" part of the university—in the colleges. The "public" or university part was weakly provided for. The last nineteenth century statutory commission had attempted to correct the imbalance by forcing the colleges to contribute some of their income to a University Chest, or by allowing the university a portion of college tui-

18. See Francois Leprieur and Pierre Papon, "Synthetic Dyestuffs: The Relation between Academic Chemistry and the Chemical Industry in Nineteenth Century France," in *Minerva*, 17 (1979), 218.

19. David Owen, *English Philanthropy 1660–1960* (Cambridge, Mass., 1964), 346 *et seq.*

tion to subsidize new subjects, or by consolidating small fellowships and assigning them to university purposes. When this plan was first envisioned college income was booming. A number of colleges had made a killing in the sale of land for the construction of railroads. But after 1870 college income declined as a result of the agricultural depression, very definitely threatening expansion and diversification. Consequently, both old and new institutions were in need of additional support.

Late Victorian dons have filled the pages of university history with complaints that their institutions were left impoverished, but in fact considerable support was forthcoming from the manufacturing community, if not in equal amounts to each institution, or for every subject now the object of academic professionalism. Some famous industrialists came forward with substantial sums for laboratories, chairs and buildings, as did those grand old benefactors, the London livery companies, but not on a scale comparable to American philanthropy. The contributions of municipal corporations, local professional associations, mechanics institutes, great commercial houses and industrial firms in creating technical colleges and university colleges has often been told. Most of the money given was for science and technology, for this was where new money was most needed and where individual professors were most active in soliciting support; but insofar as research was becoming important, there was no instant or automatic response to the financial requests of professors and heads, no immediate perception by all sectors of the business community that the support of university-based science and technology was essential to national economic strength. Nevertheless the metals and engineering industries of the north developed strong working relations with Sheffield, Birmingham and the Imperial College. Ship engineering and naval architecture were features of Glasgow, Newcastle and Liverpool universities. Brewing linked up with Birmingham.[20] These connections greatly benefited the civic universities in their earliest years, and they even contributed directly to the growth of specialism, since the spinoff from applied technology could and did stimulate work in basic science. Proximity to local industry or a strong and identifiable sense of civic pride on the part of the community seemed to be a requirement for good working relations between universities and industry, because the London professoriate, which aided other industries like steel and textiles, aircraft and radio-communications, did not succeed in attracting substantial pre-war financial support from Thameside manufacturing.[21]

The success of fund-raising varied according to time and place. There was, for example, no satisfactory response to the appeals of Oxford and Cambridge for help—at least collecting fell far short of announced goals, despite a really heavily-orchestrated campaign by specially-designed fund-raising associations representing a large number of fields. The campaign, in fact, had an adverse effect upon university morale and produced a split in the faculty, a fear on the part of some dons that big science would dominate the ancient universities and compromise the college system.[22]

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20. Sanderson, *The Universities and British Industry,* 10 *et seq.*
21. Sanderson, "The University of London and Industrial Progress, 1880–1914," *Journal of Contemporary History,* 7 (1972), 243–61.
22. George Haines, *Essays on German Influence upon English Education and Science, 1850–1919* (Hamden, Ct., 1969), 143–4; Rothblatt, *Dons,* 254–6.

Here, before the First World War, was a sign of the internal fracturing of the university under the pressure of the competition for funds, an indication of the primacy of the discipline over any university-wide loyalty. The Oxbridge appeal was unsuccessful partly because of the collapse of the "natural" constituency of the two universities, the old university-clerical world, and the failure as yet to acquire a new one. Many dons still harbored an anti-business scruple, and the feeling was reciprocated, but others very busily pursued the Edwardian millionaires, oblivious of the historic taboo.

Academic Interest Groups:

That supply is more important than demand in allowing diversification to take place receives confirmation from the actions of Victorian and Edwardian dons in securing an adequate support base for innovation and growth within higher education. English academics were not shy when it came to expressing their desires for patronage or their need for money, and from the middle of the century onwards the solicitation of funds for higher education projects was active and steady. Quite possibly the Parliamentary Committee of the British Association for the Advancement of Science was the first organized scientific pressure group on the historical scene. Reacting to the interest in applied science that followed the Crystal Palace Exhibition of 1851, it sought support for pure or basic science.[23] In the decades that followed famous names like Roscoe and Playfair, Thomas Huxley and Mark Pattison, and of a later generation, Haldane and Lockyer, kept the pressure up as very accomplished and energetic publicists. They formed professional associations, interest and lobby groups, arranged for newspaper coverage, made public speeches, contacted prominent benefactors, politicians and members of the civil service, and by so doing kept the requirements of modern universities foremost in the public consciousness. Many of them had spent some period of their early life in Germany, and they constantly referred to the German universities as the model universities, publicly comparing the support received there or in America with that in England. They were loudest on behalf of newer subjects, and because of this, as well as because of the rather strident tone of their campaigns, they irritated more reticent and less needy dons who believed that university autonomy would be adversely affected by new ties of dependency should the great publicists succeed.

Generational Factors:

There was a decided generational element in the diversification of higher education, but more work must be done before deciding how significant its overall contribution was. I would suggest that it was most important at the beginning of the development of a sub-discipline or at a moment of expansion, but as Joseph Ben-David and Awraham Zloczower have argued in connection with German disciplinary growth, the

23. David Layton, "The Educational Work of the Parliamentary Committee of the British Association for the Advancement of Science," in *History of Education*, 5 (1976), 25–39.

generational element must be combined with the structural peculiarities of an academic system in order to be significant. For structural reasons age-specific behavior is part of the history of teaching and reform at Oxford and Cambridge. The fellowships system there skewed appointments so that before the 1880s' abolition of celibacy and holy orders as requirements for tenure, fellows were either very young or very old. Younger dons were always involved in the Oxbridge reform movements of the nineteenth century because they had the most to gain in challenging what often amounted to a gerontocracy. Towards mid-century they very definitely spearheaded the attack on the "old college system," pressed for State intervention, insisted on the necessity for full-time academic careers and helped produce a revolution in teaching. Foreign and domestic observers were struck by the decidedly youthful tone of Oxford and Cambridge after the reform period. Romantics and aesthetes were enchanted by the beauty, insouciance and grace of the Oxbridge undergraduate in a setting of parks, gardens and ancient buildings; but others, who believed universities existed for the advancement of learning, were depressed by the immaturity, public school ethos and lack of intellectual seriousness in collegiate life.

The rather sudden expansion of the professoriate in the critical reform decade after 1876, partly in response to increasing matriculations and State pressure but also equally a function of professionalization, provided new career opportunities for young scholars and scientists who had been preparing themselves for precisely such a change. At Oxford the university teaching staff increased from 40 to 63, over half of whom received appointments after 1880. At Cambridge there was an even more spectacular infusion of new blood, since 61 out of 73 university appointments had been made since 1870.[24] The same effect occurred throughout the constituent colleges, providing Oxbridge with one of its most characteristic staffing peculiarities, a checkerboard of indolent old sinecurists and eager young hotshots. Certain disciplines were clearly being carried on by younger men, and this may have been true elsewhere in England during the early period of expansion. Before the institution of the research degree, long periods of academic apprenticeship were not required, and young men could be called to leadership positions early in their careers. One Principal of Firth College, Sheffield, was only 24. Sir George Humphrey was 22 when he became surgeon to Addenbrooke's in Cambridge. The study of European scientists circa 1900 by Heilbron, Forman and Weart shows that English physicists were much younger than their German counterparts,[25]and although they are reluctant to speculate on this fact, it is conceivable that this was one of a number of factors that account for the success of certain branches of physics in the period before the war. Such opportunities as existed in academic life before 1914 were not duplicated again until the great expansion of the 1960s, which likewise opened up opportunities for a younger generation of scholars and scientists.[26]

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24. Haines, 106.
25. Paul Forman, John L. Heilbron and Spencer Weart, "Physics *circa* 1900," in *Historical Studies in the Physical Sciences,* 5 (1975), 50–55. The median age of entry into the full professorship of physics was 32 in the United Kingdom but 37 1/2 in Germany.
26. The number of university teachers in the U. K. grew slowly if steadily from 1900 to the mid-1940s, when a sharp swing upward occurred. The graph is very steep in the 1960s and 1970s. See A. H. Halsey and Martin Trow, *The British Academics* (London, 1971), 140.

While research and specialism go together, directly affecting the process of faculty recruitment, the actual structure or constitution of an educational institution also plays a part in determining where and when innovation can enter the curriculum. However, as we shall see, no firm historical conclusions regarding the institutional forms most conducive to innovation are possible. What appears to be an organizational advantage may only be temporary, and what seems to be a structural barrier to change may turn out to be a boon. The internal organization of a university, school or college is no more independent than any other variable.[27] Nor is the age of an institution an indication of whether its faculty will readily take to fresh ideas or remain tradition-bound. It has been said of the University of Hull, which was founded in the late 1920s, that it was not innovative despite its youth, that on the contrary, it was born "middle-aged"[28] (like Falstaff, presumably, at three o'clock in the afternoon with something of a large belly).

Nevertheless, it is possible to suggest that from their inception the civic universities possessed a short-term structural advantage over Oxbridge in moving towards the research conception of a university. The organization of professors and lecturers into faculties—Arts, Sciences, Medicine, Technology, Commerce—put authority for courses of study, scholarships, prizes, appointments, degrees, diplomas, and certifications directly into the hands of faculty committees, whereas at Oxford and Cambridge right up to the war and beyond, responsibility for these was a confused matter of decision-making shared between university boards of studies, the "old schools," colleges and large bodies of alumni constitutionally empowered to vote on matters of curricula. In part the "country vote" was seen as an advantage in the earlier years of the nineteenth century when maintenance of the aristocratic and clerical ascendancy in the university was more important than innovation and discovery, but it was a decided liability three quarters of a century later when academic professionalism was attempting to reshape the intellectual character of the universities. Slowly, through a number of constitutional and structural changes that occurred in the years before the war, the university parts of Oxford and Cambridge came to dominate the colleges and to create what is now sometimes referred to as a federal system. The non-researcher, the "good college man," has been an endangered species since the Edwardian period.[29]

Another reason why the civic universities in their earliest years were able to do important work in applied research was necessity. Professorial remuneration varied

27. For a contrary view with respect to Germany, see the contribution of Peter Lundgreen to this volume.
28. Charles Carter, "On Being a Middle-Aged University," review by T. W. Bamford, *The University of Hull: The First Fifty Years* (Oxford, 1978), in *Minerva*, 17 (1979), 180–3.
29. It may even be suggested that the idea of the small American liberal arts college is also moribund, insofar as the curriculum is modeled precisely on that of the large research universities and the education of the faculty is that of the research scholar or scientist. See Rothblatt, *Tradition and Change in English Liberal Education, an Essay in History and Culture* (London, 1976).

greatly within redbrick, but it was usually less than what was deemed to be the necessary income of a professional gentleman. While endowments provided some income support, remuneration was also affected by matriculations, with laboratory and lecture fees providing a crucial portion of salary. Since enrollments were unreliable in the early years, professors went outside the universities into consulting and applied research, much as the old unreformed Oxbridge professoriate cast about for a living in the church or law and government, or the collegiate fellows went into private teaching. A further reason for the substantial interest in applied research at the civic universities was the generally low level of student preparation. The mathematics professors at Leeds simply refused to do remedial teaching.[30] As teaching institutions the redbrick reputation suffered in comparison with Oxbridge, but as centers of technology, their success record in applied research was substantial.

From the standpoint of profession-building, however, the situation that existed at Leeds, Sheffield, Liverpool and Nottingham was far from satisfactory. Consulting as a steady means of income supplement was not reliable, as the work depended upon the needs or desires of the consulter, as did any externally-sponsored research. Under these conditions certain kinds of intellectual problems could not be pursued; and some forms of basic science suffered. Ironically, what soon freed the redbrick professoriate was the development of research laboratories within industry itself—laboratories which no longer required the services of an outside consultant or researcher but which could still absorb graduates trained by him.[31]

The situation was different with respect to arts subjects. While the demand for instruction began to increase with direct and indirect government subsidies for the training of teachers, there were few opportunities for outside work. In addition, relations between teachers and potential benefactors or employers were sometimes strained. The establishment of arts faculties in redbrick universities owed much to Oxbridge—sponsored extension lectures and a system of local examinations. Arts lecturers and professors were often recruited from Oxford and Cambridge. Touched with the clerisy brush, believing in the civilizing purposes of liberal education, they were occasionally at odds with a community of practical-minded philanthropists and potential donors. Nathan Bodington, the Principal of Leeds, who was trained in classics at Oxford, was one of those Victorian academic leaders who did not get on with local business precisely because of his different outlook on the purposes of university education.[32]

At Oxford and Cambridge, the collegiate organization of teaching and the absence of a newer-type senate organization with overall responsibility for curriculum and instruction forced innovation along different lines. One of the reasons why the diversification of intellectual and academic life at Oxford and Cambridge is so difficult to follow is that there were so many different possible entry points into the system. Who would have predicted, for example, that the teaching of Scandinavian languages at Oxford was introduced by the Oxford University Press, which suddenly found itself with money that could, in the hands of an interested party, be diverted for the pur-

30. A. N. Shimmin, *The University of Leeds, the First Half Century* (Cambridge, 1954), 19.
31. Sanderson, *Universities and British Industry*, 94, 119.
32. Shimmin, 13. The year was 1882.

pose,[33] or that the famous Cambridge medical school led by the physiologist Michael Foster would be partly the result of the reform movement within Trinity College, which brought him to Cambridge with a college appointment? If the collegiate structure of Oxbridge was a handicap in some ways, it was beneficial in others, and many instances of college sponsorship of new work could be cited. A college might be more interested in teaching traditional subjects than in providing for new ones, but once interested in new work and new subjects, it was easier for a single college to introduce them than open the matter to university-wide debate. Science had been coming into the universities this way ever since individual dons installed their personal, primitive laboratories in out-of-the-way college rooms at the beginning of the nineteenth century.[34]

The Cavendish Laboratory is probably the most famous example of how diversity could occur at Oxbridge. A handsome endowment from Lord Devonshire, an aristocrat-industrialist, established a well-equipped Cambridge laboratory that stood outside both the collegiate structure and the faculty organization. The Cavendish did not have to prepare students for examinations, and it was in a position to attract and train young researchers entirely out of its own resources. The lines of inquiry of the Cavendish were established by its great directors, Maxwell, Rayleigh, J. J. Thomson and Rutherford, and because of this independence the laboratory was able to take advantage of the introduction of research degrees into Cambridge in 1895 to sponsor research dissertations which could then be used by colleges—if they chose—as a basis for appointments to fellowships. The Cavendish developed a special ethos, as symbolized by its famous afternoon teas, and became the model for scientific work, expressing in perfect measure all of the requirements of academic professionalism. Some of the success of the Cavendish was repeated at Manchester, which also had a well-endowed physical laboratory; but elsewhere, because of less generous support, professors associated with laboratories had to spend a greater amount of time teaching the more elementary aspects of their subject.[35]

The Action of Government and the Effect of War:

While its role varied, the State was involved in higher education from the start. In subtle and indirect ways at first, and in direct ways later, the State can be considered one of the most decisive influences in the diversification of higher education in England. This is a somewhat unorthodox position. It is more common to contrast the English State with the German one and to point out, often deprecatingly, how uninterested it was in the problems of university education, science, technology, teacher training and academic discovery. I would like to suggest that this was not exactly the

33. Charles Firth, *Modern Languages at Oxford, 1724–1929* (Oxford, 1929), 55–7.
34. In the right academic setting with the right student even neglect plays a part in encouraging innovation. Thus it was the student subculture of collegiate Oxford that enabled the brilliant young scientist, Harry Moseley, to advance in his physics studies. See John L. Heilbron, *H. G. J. Moseley, The Life and Letters of an English Physicist, 1887–1915* (Berkeley, 1974), 37 *et seq.*
35. Romualdas Sviedrys, "Physical Laboratories in Britain," in *Historical Studies in the Physical Sciences*, 7 (1976), 435.

case. The historical problem has been oversimplified because of the failure, as Roy MacLeod has noticed, of historians of science (and universities) to recognize the particular features of government in the nineteenth century.[36]

It is true that in the nineteenth century the island was passing through what is commonly called a "liberal" phase. This textbook commonplace, while containing a particular kind of truth, does not tell the whole or even the most important part of the story. Talk of a minimal state in 1860 might have made good copy but poor history. Centuries of development had created a very powerful central State, and the unique history of English constitutionalism (as measured against other European countries) had allowed a fairly large and experienced group of titled and lesser aristocracy, much interpenetrated with the other strata of English society, to gain political experience at every level of government, national or local. By historical habit the landed aristocracy was interventionist. Furthermore, the English State was not what it was in Romantic thinking, an abstraction embodying national purpose, the whole to which the parts adhered and the spiritual as well as political center of national life, but a collection of ministries, boards, agencies and councils performing a variety of tasks, not always strictly coordinated, and by a complicated process of legislative and executive interaction subject to a variety of competing demands and wishes. This too was an aristocratic legacy—the product of oligarchy rather than monarchy, of a community of peers equal in status if not in power or income.[37] In these circumstances the great landlords and heads of houses could continue to exert influence at the very heart of English politics, and individual ministers, undersecretaries and other civil servants were relatively free to respond to the changing social conditions of English life as their education, networks of friends, past associations and political ambitions inclined them.

Against the Liberal doctrine of the minimal State, then, must be laid the custom of State intervention along the ancient caravan routes of aristocratic patronage. But even the Liberal State recognized the necessity of ad hoc decision-making in response to specific problems or demands. This temporary conjunction accounts for the characteristic responses of the Victorian State even as it moved forward in the second half of the nineteenth century to rational, bureaucratic government. Decision-making could occur almost anywhere within the structure of government, and consequently there was indeed some provision of State aid to higher education, even to research, but it was not systematic. The various agencies of government, as yet uncoordinated by the Treasury, made decisions independently of one another, and advice was sought where needed. Even before the enactment of the famous civil service reforms of the nineteenth century, experts and consultants were brought into government to advise on matters of educational policy, and even in the supposed heyday of the minimal State there was an impressive range of government assistance to the higher education sector. For example, recent writers have emphasized how much

36. R. M. MacLeod, "Science and the Treasury: Principles, Personalities and Policies, 1870–1885," in *The Patronage of Science in the Nineteenth Century,* ed., G. L. E. Turner (Leyden, 1976).

37. Hence the vulnerability of aristocratic cabinets to outside pressure groups in the early Victorian period. See D. A. Hamer, *The Politics of Electoral Pressure* (Hassocks, Sussex, 1977), 324–8.

scientific research activity was sponsored by government in the first half of the nineteenth century.[38] There were tidal, ordinance and geological surveys and expeditions. The government supported scientific posts at the Botanical Garden at Kew, the observatory at Greenwich and the Assay Office of the Royal Mint. The Medical Department of the Privy Council contributed to various kinds of scientific projects. The Inland Revenue and Excise Department sponsored astronomical, hydrographical and munitions research, and the Commissioners of Woods and Forests encouraged geological work through the Museum of Economic Geology and the Mining Records Office. A Government School of Mines and Science Applied to the Arts was founded in 1851. Parliamentary grants were given to the various royal societies, sometimes as on-going subventions, sometimes for specific projects, so that the Royal Society, the Royal Geographic Society, the Royal Society of Edinburgh, the Scottish Meteorological Society could count on intermittent and recurrent assistance from London.

In support of teaching the government provided for the Regius professorships at Oxford and Cambridge, and, for reasons that go back to the ancient days of a separate Scottish Parliament, Whitehall assumed financial responsibility for the universities of Scotland. For the new examining University of London the government provided aid from the late 1830s onwards for the conduct of examinations, the award of prizes and honors, and for maintenance and repairs to buildings.[39]

In the later nineteenth century and twentieth century even much greater assistance went to higher education. The new universities and colleges received money (initially at their request), as did the new Welsh universities and Irish ones. The Board of Education supported the Imperial College, referred to journalistically as the new South Kensington "Charlottenburg." The Treasury increasingly supported engineering and medicine, including the medical school at Cambridge—this before the institution of recurrent state grants to Oxford and Cambridge. The National Health Insurance Act of 1911 funneled some money into medical research as well, and thereafter a Medical Research Commitee of the Privy Council was formed. The Board of Agriculture gave research grants from the 1890s onwards and afterwards financial support was carried on by a Development Commission for Agriculture and Fisheries. Local authorities, too, contributed to civic universities and to London University before and after the reorganization of local government in the last decades of the nineteenth century, but the major support came from the State and its executive branches. In fact the State, in creating national systems of elementary and secondary compulsory education, did more for the teaching of science generally and indirectly for the diversification of higher education than any other single source after the turn of the century. Grants were given to all institutions possessing departments for the training of teachers. State action drove up enrollments, stabilized university income, and stimulated growth in the size of teaching and research staffs.

The First World War produced more State activity. The military technology effort led to increased aid of all kinds to the education sector. After the war, because of the

38. MacLeod, "Resources of Science in Victorian England: The Endowment of Science Movement, 1868–1900," in *Science and Society, 1600–1900,* Peter Mathias, ed. (Cambridge, 1972), 111–66; W. H. Brock, "The Spectrum of Science Patronage," in Turner, *ibid.*

39. Eric Hutchinson, "The Origins of the University Grants Committee," in *Minerva,* 13 (1975), 583–6; Robert O. Berdahl, *British Universities and the State* (Berkeley, 1959), 20–68.

running down of plants due to forced neglect, the insatiable requirements of big science and the need to find better support for junior faculty, as well as the distortion in enrollments produced by conscription and wartime manpower needs, the University Grants Committee was created to put the financing of higher education on a firm and consistent basis. In the same spirit the Department of Scientific and Industrial Research was projected in 1915.

There is no doubt that the war years were a watershed in university-State relations. Yet I would like to stress that the machinery for government intervention into the higher education system had long been in place, as well as an attitude of assistance congenial to the academician. This explains why unaffiliated intellectuals like the Benthamites, or individual Oxbridge dons, or members of the clerisy or science publicists like Playfair and Roscoe readily turned to the State for support. The Victorian intelligentsia had always been more confident of their ability to persuade government to support them than private philanthropy. They were confused about the meaning of industrialism, worried about political democracy even when they spoke in favor of it, fearful of the effects of cultural pluralism after centuries of leadership from above by the landed aristocracy and its hangers-on, the "natural leaders" of society. They worried more about the possible effects of "public opinion" than about government intervention, and as academic professionals they preferred to risk their independence with the latter than with the former. The Liberal voice of the nineteenth century may from time to time have expressed concern about the consequences of heavy state funding for higher education, but it was only one of several influential voices. And these are the reasons, if not the only reasons, why England before the First World War moved towards the European model of centrally-supported higher education rather than towards the American one of private, local and regional support, despite some of the heavily plural and decentralized features of Victorian civilization. After all, honors, recognition and prestige had always flowed downward from the Crown and government; central direction had always characterized the English State. In historical perspective the Liberal State was only an interlude.